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in

Kyriazopoulos A.P. (ed.), López-Francos A. (ed.), Porqueddu C. (ed.), Sklavou P. (ed.). Ecosystem services and socio-economic benefits of Mediterranean grasslands

Zaragoza : CIHEAM
Options Méditerranéennes : Série A. Séminaires Méditerranéens; n. 114

2016
pages 139-142

Livestock farming in Algerian semi-arid forests: the case of Boutaleb forest

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Abstract. Agriculture and livestock breeding have always existed in the forest of Boutaleb, Northeastern Algeria. A study was carried out in 2008, and aimed to collect data on agriculture and breeding systems to set up a development project. The study involved 116 farmers and dealt with households, production units and their relationships with the forest resources. The data collected was analyzed using multiple correspondence and hierarchical clustering methods. The average seasonal grazing period of small ruminants in the forest of Boutaleb is 6 months per year. The breeding was deemed a good way to enhance and take advantage of the region's silvopastoral resources. The typology has distinguished four farming systems: (1) Small and very extensive, (2) Small and moderately supported, (3) Medium-size and supported, (4) Large and relatively intensive. In addition, the study showed that 97% of farms are family-run and reserve 96% of their agricultural area for wheat and barley production for human and animal consumption to compensate for the lack of silvopastoral resources during the lean season. Subsequently, proposals to protect the environment and promote the synergy between silvopastoral resources and ruminant breeding were recommended.

Keywords. Algeria – Boutaleb semi-arid forest – Breeding systems – Silvopastoral resources use – Development project.

L'agriculture et l'élevage dans les forêts semi-arides algériennes – cas du massif forestier du Boutaleb

Résumé. *Le massif forestier du Boutaleb, situé au nord-est algérien, est marqué par la présence de l'agriculture et de l'élevage depuis toujours. La présente étude, menée en 2008 dans le cadre d'un projet d'aménagement, avait pour objectif de recueillir des données sur l'agriculture et l'élevage. 116 exploitations d'élevage ont été approchées à travers l'étude du ménage, les structures de production, la conduite des troupeaux et le rapport de l'élevage à la forêt. Les données collectées ont fait l'objet de typologie utilisant l'analyse des correspondances multiples suivie par la classification ascendante hiérarchique. La durée de séjour moyen des petits ruminants dans la forêt est de six mois par an, et l'objectif recherché est de valoriser le maximum de ressources sylvopastorales. Par ailleurs, l'étude a montré que 97 % des exploitations sont à caractère familial et réservent 96 % de la surface agricole aux cultures de blé et d'orge pour la consommation familiale et animale. Les animaux sont complémentés en périodes de manque de ressources sylvopastorales lors des périodes déficitaires. En outre, la typologie a permis de distinguer 4 systèmes d'élevage : (1) petits élevages strictement extensifs, (2) petits élevages moyennement soutenus (3) moyens élevages soutenus (4) grands élevages semi- intensifs. A la lumière de ces résultats, des propositions pour protéger les ressources de la forêt et promouvoir la synergie entre l'élevage et la forêt ont été dégagées.*

Mots-clés. *Algérie – Forêt semi-aride de Boutaleb – Systèmes d'élevage – Sylvopastoralisme – Projet d'aménagement.*

I – Introduction

In Algeria, forests cover 3.6 million ha and are an important environmental and socio-economic heritage (Naggar, 2000). In North-eastern part of Algeria, the forest of Boutaleb offers many ecosystem goods and services for the montanious community to create activities that allowed it to settle and provide benefits. Livestock, which is the most important economical activity of the community, transforms the unwanted silvopastoral vegetation into animal products, increase income of farmers and improve nutritional statut of farms.

The Boutaleb forest is disadvantaged because of its marginalisation and low level of productivity, as other mountainous areas. In order to sustain the forest, and due to the importance of its area (28,416 ha), Boutaleb benefited in 2008 of a development project. This research fits precisely within that framework and deals with livestock in the region through its socioeconomic and technical issues, and aims to identify the diversity of farms, understand the use of silvopastoral resources by livestocks, and suggest actions for enhancing the forest/breeding partnership to sustain the forest.

II – Study area and methodological approach

1. Study area

The forest of Boutaleb is located between the Setif high plains and the Hodna basin (Bertraneu, 1952), and constitute a link between them. It covers 28,416 ha and peaks at 1,890 m. The region's rainfall contrasts between years, and depends on the exposure; the rainfall varies from 550 to 600 mm / year on the North hillside, and can reach 754 mm high up, but receive only 312 mm/year on the South hillside. Extreme temperatures of the coldest and warmest month recorded averages of -2.3 ° C and + 32 ° C (Boudy, 1955). Hence, agriculture in this region is practiced in a disparate biophysical environment.

2. Methodological approach

A preliminary survey of different institutions (municipalities, agricultural services authority and its subdivisions) was conducted. The goal was to collect basic data on the population and its activities, particularly agriculture and livestock, in order to identify local trends. Then, 116 livestock farms, spread across the silvopastoral dedicated areas identified in the first phase were randomly investigated. The investigation was conducted in one single visit and took 30 to 60 minutes per farm.

To start with, we carried out a descriptive analysis to summarize the farms' characteristics. Then a Multiple Correspondence Analysis (MCA) followed by a hierarchical clustering (HCA), were carried out to create typologies. We selected eleven variables related to the farm's structural aspects (livestock species and numbers), functional aspects (food, reproduction) as well as those related to the use of the silvopastoral vegetation.

III – Results and discussion

1. General description

Descriptive analysis showed that the average of the total cultivated area per farm is 5 ha, of which 96% is allocated to the cultivation of cereals for human consumption (wheat) and animal feed (barley and oats), while vegetable and tobacco crops take place in farms with water resources. The study also showed that small family farms represent 97% and do not use hired labor.

Livestock in the forest of Boutaleb is silvopastoral and low input oriented; farmers involve mainly small ruminants, which are from local breeds, hardy and well adapted to their environment. Flocks, as in the other southern Mediterranean regions, are largely run by small farmers, unorganized and are not receiving supervision (Naggar, 2000). Sheep farming is present at 99% of farms, due to high demand of market for its meat, which is traditionally the most appreciated by the North African population (Rondia, 2006). It is reared alone (25%), or in mixture; with goat (44%), with cattle (16%) or with both (15%). Cattle breeding are more present on the north side areas since they provide more food resources than the south side, thanks to a higher rainfall. Herds' size per farm is often limited (2 cows), which are kept to provide milk for the household while calves are raised and fattened to allow additional incomes. Cattle are fed with products from agricultural activity, and concentrates purchased on the market, but do not

utilize forest resources. Consequently, analysis of livestock systems has taken into consideration only small ruminants livestock.

2. Livestock systems

The analysis of small ruminants breeding systems allows distinguishing four different systems, ranging from most extensive to more sustained (Table 1):

Table1. Main features of the 4 livestock systems

		Type1 (36%)	Type2 (28%)	Type3 (16%)	Type4 (20%)
Numbers	Sheep	<25	25 to 50	25 to 50	50 to 400
	Goats	<10	Variable	> 22	Variable
	Cattle		Absent		Present
Period of grazing forest vegetation (number of months)		5 to 6 (autumn + winter)	2 to 3 (winter)	5 to 6 (autumn + winter)	5 to 6 (autumn + winter)
Nature and level of feed supplementation		Enough roughage and little or no concentrate	Average amounts of straw and wheat bran	small amounts of straw and wheat bran	Average amounts of hayn, straw and enough concentrate
Period of feed supplementation		Period of bad weather	Lack of silvopastoral resources and periods of bad weather		Lack of silvopastoral resources, bad weather, critical physiological stages
Purpose of feed supplementation		Ensure the animals' survival	Compensate for grazing	Compensate for grazing	Ensure the herd's good performance
Period of presence of rams in the herd		Reproduction period	Reproduction period	Reproduction period	Permanent
Lambing period		Late (end autumn, winter)	Late (end autumn)	Peak season (mid-autumn)	Peak season (mid-autumn)
Type of product		Lean	Lean	Lean, fattened	Lean, fattened
Selling period		As needed	As needed, summer	As needed, Aïd El Kebir religious Festival	As needed, Aïd El Kebir religious Festival

- **Small extensive pastoral sheep and goat farms.** Breeders in this group rely for feeding their livestock on grazing, especially the silvopastoral resources, which provides the dominant part of the flock feeding during the year; the majority of breeders give occasionally concentrate as feed complementation, except when survivability of animals is a challenge. Feeding practices lead to late lambing towards the end of autumn or even winter. Animal products are sold without fattening, to earn some cash for the household's daily needs.
- **Moderately sustained pastoral livestock with sheep and goat.** It involves herds of less than fifty heads of different sizes. These herds graze in the forest for a shorter period than the first group. In this group the distribution of concentrated supplements is substantial, leading to earlier births, when compared to the first group. Products are sold without fattening, but are sometimes wholesaled in the summer, after grazing during the period of pastoral resources availability.
- **Sustained pastoral farms.** In this group, farms have sheep flocks of fewer than 50 heads and rather big goat herds, more than 22 heads, when compared to the other groups. In addition to grazing for a long part of the year, these herds benefit from feed supplements (concentrate and cereal stubbles), but less than the previous group. After the period of

grazing, marketable products are submitted to a fattening period of 2 to 3 months before being sold during the religious festival of Eid-el-Kebir. Despite a lower supplementation than for the previous group, the lambing takes place early, in mid-autumn, probably due to the quality of pastoral resources and their impact on body condition and reproduction of flocks.

- **Supported and diversified large farms** They are found only in the northern part of the forest. Farmers own large sheep flocks, the size can be up to 400 heads, merged with goat herds of different sizes. Farms possess also cattle and other species (beekeeping, poultry). This group practice a diversified agriculture (cereals, fodder, vegetables and tobacco) too, which provides food and additional incomes to ensure more security to the house hold, and permit also the development of the production system. The animals intended for slaughter are subject to a longer and more intensive fattening period than the previous groups.

IV – Conclusion

The results of our study emphasize the importance of pastoral resources of Boutaleb forest for the security and sustainability of livestock systems of farmers settling in the forest and at its border. The diversity of breeding systems depends on the presence of agriculture and the silvopastoral potential of the forest, which led and driven the objectives and the strategy of the farm. The diversity in livestock systems leads also to a diversity of product (meat) on the market at different periods of the year.

As part of this management project, development actions should consider the local community and their activities, specially agriculture and animal breeding with an emphasis on their diversity, as the focal points. In addition, seeing that feed is a limiting factor for livestock development in Boutaleb region, especially in small farms, we suggest, as principal actions, the multiplication of water-points in order to develop irrigation of fodder crops. The management plan of forest areas should also contribute to limit and protect them against fires, while offering more silvopastoral feed resources to local community, by integrating and organizing the grazing activity. This silvopastoral management plan will be a vital and important action to sustain the forest vegetation and improve silvopastoral resources.

Acknowledgements

The authors would like to thank Ms. Hanane Smili and Mr. Touffik Sahraoui for their assistance with this article.

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